

REMARKS

Election/Restrictions

Restriction was required under 35 U.S.C. 121 to claims 1-6, drawn to a rapid thermal anneal system with reflective index monitor, classified in class 156, subclass 345.24; and claims 7-10, drawn to a method for detecting contamination on a reflector plate situated in a rapid thermal anneal chamber, classified in class 438.

Applicant elects without traverse to prosecute the invention of claims 1-6, drawn to a rapid thermal anneal system with reflective index monitor (class 156, subclass 345.24). Claims 7-10 have been canceled as being drawn to a non-elected invention.

Claim Rejections under 35 U.S.C 103

Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakos, et al., U.S. Pat. No. 5,226,732, in view of Kawada, et al., U.S. Pat. No. 5,536,359.

It is respectfully submitted that the Nakos patent, in view of the Kawada patent, fails to teach or suggest all of the limitations of claim 1, and claim 2 as dependent from claim 1, as required for obviousness, as hereinafter described in detail.

In the second full paragraph (no. 7) on page 3 of the instant Office action, it was stated, "Nakos et al. disclose a rapid thermal anneal system...comprising...a monitor (pyrometer, 48) provided in said at least one opening, respectively, for monitoring a reflective index of said reflector plate...". It is respectfully submitted that the pyrometer (48) disclosed in the Nakos patent is not a reflective index monitor, as suggested, but rather, is a temperature-measuring device which is used to monitor the temperature of a wafer inside a thermal processing chamber.

Reference is made to col. 1, lines 14-18 of the Nakos patent, where it is stated, "Optical pyrometry is a well known method of obtaining information about the temperature of a workpiece, such as a semiconductor, e.g. silicon, wafer, in a contactless manner, particularly in rapid thermal processing systems".

Accordingly, it is clear from the teachings of the Nakos patent that that the function of a pyrometer is to measure the temperature of a wafer, "in a contactless manner". This is in contrast to a reflective index monitor, the function of which is to monitor the degree of reflectivity of a surface, independent of temperature. No mention is made in the Nakos patent of providing "a reflective index monitor...for monitoring a

reflective index of [a] reflector plate" inside a thermal processing chamber, as recited in claim 1 and claim 2 as dependent therefrom.

It is noted that col. 4, lines 26-29 of the Nakos patent states, "Direct electromagnetic radiation 54 and reflected electromagnetic radiations 56 from the surface of the wafer 26 are shown being introduced into the optical pyrometer 48...".

Accordingly, the pyrometer of the Nakos device is positioned to receive electromagnetic radiation from the surface of a wafer inside a thermal processing chamber to measure the temperature of the wafer, rather than to receive electromagnetic radiation reflected from a reflector plate "for monitoring a reflective index of said reflector plate", as defined by claims 1 and 2.

It was further stated, in the second paragraph (no. 7) on page 3 of the Office action, that the Nakos patent discloses a rapid thermal anneal system comprising "...a process controller (58, column 3, rows 30-33) operably connected to said reflective index monitor and said plurality of lamps; wherein said reflective index monitor sends a signal to said process controller and said process controller controls/terminates operation of said plurality of lamps".

Reference is made to col. 4, lines 30-33 of the Nakos patent, which states, "Any suitable temperature control circuit 58 may be connected to the output Vout 50 of the optical pyrometer 48 to control the heat generated by the tungsten-halogen lamps 30".

It is respectfully submitted that the Nakos patent fails to disclose that the temperature control circuit 58 receives a signal from a reflective index monitor and "terminates operation of said plurality of lamps when said reflective index of said reflector plate deviates from a reflective index of a control value", as recited in claims 1 and 2. In contrast, it is clear that the temperature control circuit (58) of the Nakos apparatus controls the heat generated by the lamps in the processing chamber on the basis of the intensity of heat detected by the pyrometer, rather than on the basis of the reflective index of the reflector plate.

It is respectfully submitted that the Nakos patent and the Kawada patent, taken alone or in combination with each other, fail to teach or suggest a system comprising "a process controller operably connected to [a] reflective index monitor and [a] plurality of lamps" and in which a "reflective index monitor sends a signal to said process controller and said process controller terminates operation of said plurality of

lamps when said reflective index of said reflector plate deviates from a reflective index of a control value", as recited in claims 1 and 2.

It is therefore respectfully submitted that the Nakos patent, in view of the Kawada patent, fails to render claims 1 and 2 obvious within the contemplation of 35 U.S.C. 103(a). Reconsideration and allowance of claims 1 and 2 is therefore respectfully solicited.

Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakos, et al., and Kawada, et al., as applied to claims 1 and 2, and further in view of U.S. Pat. No. 6,125,789, to Gupta, et al..

It is respectfully submitted that the Nakos patent, the Kawada patent and the Gupta patent, taken alone or in combination with each other, fail to teach or suggest all of the limitations of claims 3 and 4 as dependent from claim 1.

Specifically, the Nakos, Kawada and Gupta patents, taken alone or in combination with each other, fail to teach or suggest a system comprising "a reflective index monitor...for monitoring a reflective index of [a] reflector plate; a process controller operably connected to said reflective index monitor and [a] plurality of lamps" and in which a "reflective index

monitor sends a signal to said process controller and said process controller terminates operation of said plurality of lamps when said reflective index of said reflector plate deviates from a reflective index of a control value", as recited in claim 1 and defined by claims 3 and 4 as dependent therefrom.

As set forth herein above with respect to the rejection of claims 1 and 2, it is respectfully submitted that the pyrometer disclosed in the Nakos patent is not a reflective index monitor, but rather, is a temperature-measuring device. Furthermore, the process controller or temperature control circuit (58) of the Nakos apparatus is limited to controlling the temperature of the processing chamber on the basis of heat energy received by the pyrometer, rather than on the basis of the reflexive index of a reflective plate.

Neither the Kawada patent nor the Gupta patent, taken alone or in combination with the other, teaches or suggests "a process controller operably connected to [a] reflective index monitor and [a] plurality of lamps" and in which a "reflective index monitor sends a signal to said process controller and said process controller terminates operation of said plurality of lamps when said reflective index of said reflector plate deviates from a reflective index of a control value", as recited in claim 1 and defined by claims 3 and 4 as dependent therefrom.

It is therefore respectfully submitted that the Nakos and Kawada patents, in view of the Gupta patent, fails to render claims 3 and 4 obvious within the contemplation of 35 U.S.C. 103(a). Reconsideration and allowance of claims 3 and 4 is therefore respectfully solicited.

Claims 5 and 6 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. No. 5,226,732 to Nakos, et al., in view of U.S. Patent No. 5,536,359, to Kawada, et al., and U.S. Pat. No. 6,125,789, to Gupta, et al.

It is respectfully submitted that the Nakos, Kawada patent and Gupta patents, taken alone or in combination with each other, fail to teach or suggest all of the limitations of claim 5, from which claim 6 depends. None of those patents, taken alone or in combination with the others, teaches or suggests a system comprising "a reflective index monitor provided...in a substantially elevated position with respect to [a] reflector plate for monitoring a reflective index of said reflector plate...wherein said reflective index monitor sends a signal to [an] alarm when said reflective index of said reflector plate deviates from a reflective index of a control value", as recited in claim 5 and defined by claim 6 as dependent therefrom.


As indicated in Fig. 1 of the Nakos patent, the optical pyrmometer (48) is positioned in an opening (28) beneath the reflector plate (12) to receive electromagnetic radiation from the backside of a wafer (26) and measure the temperature, rather than the reflective index, of the wafer. It is respectfully submitted that the pyrometer (48) is improperly positioned with respect to the reflector plate (12) to receive radiation reflected from the reflector plate for any purpose, including the purpose of measuring the temperature of the plate.

It is therefore respectfully submitted that the Nakos patent, in view of the Kawada and Gupta patents, fails to render claims 5 and 6 obvious within the contemplation of 35 U.S.C. 103(a). Reconsideration and allowance of claims 5 and 6 is therefore respectfully solicited.

Conclusion

Every effort has been made to amend applicant's claims in order to define his invention in the scope to which it is entitled. Accordingly, reconsideration and allowance of claims 1-10 is respectfully solicited.

Respectfully submitted,



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